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LIST OF SYMBOLS AND ABBREVIATIONS

IWW	-	Industrial wastewater
SSFE	-	Scrapped surface heat exchangers
FC	-	FC
PFC	-	Progressive Freeze Concentration
DOE	-	Design of experiment
CCD	-	Central composite design
RSM	-	Response surface methodology
CC	-	Coil Crystalliser
COD	-	Chemical oxygen demand
RI	-	Refractive index
DSC	-	Differential scanning calorimetric
IP	-	Ice purity
RO	-	Reverse osmosis
K	-	Effective Partition constant
FL	-	Flowrate
CT	-	Circulation time
ISC	-	Initial solution concentration
CTemp	-	Coolant temperature
ΔV	-	Volume reduction
U_o	-	Overall heat transfer coefficient
C_L	-	Concentration of liquid phase
VOC	-	Volatile organic compounds
FBHE	-	Fluidized bed heat exchanger
TSS	-	Total suspended solids
UV	-	Ultra violet

BOD	-	Biochemical oxygen demand
BTEX	-	Benzene, toluene, ethylbenzene and xylene
TCE	-	Trichloroethylene
PCE	-	Perchloroethylene
μ	-	Chemical potential
μ_1	-	Chemical potential of the liquid
μ_s	-	Chemical potential of the solid
T	-	Temperature
C_S	-	Concentration of ice/solid phase
C_L	-	Concentration of liquid phase
V_L	-	Volume of liquid phase
V_o	-	Initial volume of glucose concentration
C_o	-	Initial solution concentration
$\bar{\upsilon}_{ice}$	-	Average ice growth
m^2	-	Meter squared
kg	-	Kilogram
ρ_{ice}	-	Mass of melted ice
τ	-	Length of time taken for ice growth
A	-	Area covered by ice on the plate surface
$\omega_{s,\infty}$	-	Mass fraction of the solute
w/w	-	Weight/weight
μms^{-1}	-	Micrometer per second
$u_{s,\infty}$	-	Velocity of ice front
ppm	-	Part per million
F	-	Feed flow
Cp	-	Specific heat of the feed
$d\theta$	-	Differential increase in time
dW	-	Amount of ice crystallized
ΔH	-	Heat of fusion of water
U	-	Overal heat transfer coefficient
A_m	-	Mean area for heat transfer
ΔT_{log}	-	Mean logarithmic temperature difference between feed and refrigerant

h_{amb}	-	Ambient difference between the outside surface of the freezer and the environment
ΔT_{amb}	-	Temperature difference between the outside surface of the freezer and the environment
R_F	-	Freezing ratio
V_S	-	Volume of the solid produced
V_i	-	Initial solution volume
ID	-	Immersion distance
IR	-	Immersion rate
t	-	Time of process
Bx	-	Brixx
Re	-	Reynolds number
D_e	-	Representative diameter
u	-	Average flowrate
u_o	-	Fluid viscosity
De	-	Diameter
S	-	Cross sectional area of the flow
l_p	-	Wetted perimeter
ANOVA	-	Analysis of variance
$K_2Cr_2O_7$	-	Potassium dichromate
Y	-	Predicted response value
B	-	Regression coefficient
X	-	Experimental factor influencing the process
α	-	Extreme values
R	-	Total thermal resistance from inside to outside flow $^oC/W$
h_i, h_o	-	heat transfer coefficient for inside and outside flow, respectively $W/(m^2.^oC)$
k	-	Thermal conductivity of tube material $W/(m.^oC)$
x	-	Thickness of medium wall
K_{exp}	-	K experimental
K_p	-	Model predicted K
ΔV_{exp}	-	Experimental value for ΔV
R^2	-	R-squared
Twi	-	Temperature of the wall at the inlet

Tsi	-	Temperature of the solution at the inlet
Twm	-	Temperature of the wall at the middle point
Tsm	-	Temperature of the solution at the middle point
Tcm	-	Temperature of the coolant at the middle point
Two	-	Temperature of the wall at the outlet
Tso	-	Temperature of the solution at the outlet
Tco	-	Temperature of the coolant at the outlet
A_o	-	Outside surface area
A_i	-	Inside surface areas of tube
h_g	-	Heat transfer coefficient for glucose solution
h_o	-	Heat transfer coefficients for ethylene glycol (50%)
k_i	-	Thermal conductivity of ice
x	-	Thickness of ice layer
A_m	-	Logarithmic mean area
R	-	Radius of copper tube for the CC
T_b	-	Bulk solution temperature
ΔT_b	-	Bulk solution temperature difference, ˚C
T_c	-	Bulk coolant temperature
L	-	Total length of the CC
dw/dt	-	Mass of ice formed in time t
ΔH	-	Heat of fusion of water
FPD	-	Freezing point depression

LIST OF APPENDICES